CLINICAL VOICE ACOUSTICS: FROM RECORDING TO ANALYSIS

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Disclosure

Youri Maryn has a financial interest in a website-based company, Phonanium CommV, that sells products described/demonstrated in this workshop.

Abstract

Acoustic analysis of voice signals is especially appealing in voice clinics because of multiple reasons. First, they provide easy to understand, non-invasive, and relatively low-cost solutions for objective documentation of specific features of a patient's voice (disorder). Second, they not only provide baseline measures, but they can also be applied for follow-up and for tracking voice outcomes across time and/or intervention. Third, they can offer insights in vocal physiology and may therefore serve as one of the objective guides in voice treatment. The following acoustic markers or graphs can be considered typical examples of items in a clinical voice assessment protocol: fundamental frequency (f_o), intensity level (IL), voice range profile (with at least highest F_o, lowest F_o, softest IL, and loudest IL), sound spectrography, and one or more markers of type and/or severity of hoarseness. There are many software programs and hardware options available to yield such markers. However, regardless of which combination of hardware and software, it is essential that the eventual information (either numerically or graphically) is obtained as reliable as possible and can be regarded clinically valid.

One of the software options for sound signal analysis is the program Praat (Institute for Phonetic Sciences, University of Amsterdam, Amsterdam, The Netherlands) in combination with plug-ins from Phonanium (Lokeren, Belgium). This offers (semi-)automated measurement and/or illustration of most of the clinically relevant aspects of phonation: speech-to-noise ratio and voice-to-noise ratio, IL calibration, vocal f_o, vocal IL, sound spectrography and acoustic voice markers, sound cepstrography and smoothed cepstral peak prominence (CPPS), vocal range estimation, Dysphonia Severity Index and Acoustic Voice Quality Index.

This workshop will start by discussing the importance of working with audio recordings with sufficient signal-to-noise ratio, especially for acoustic measures of voice quality. What it comes down to, is that all relevant vocalizations and speech tokens are as least as possible contaminated by recording-related noise. This implies knowledge about and choices in sound recording equipment. Once it has been shown that the audio samples have acceptable quality by using the plugin for speech-to-noise ratio and voice-to-noise ratio, the following scripts will be (a) live demonstrated and (b) discussed in terms of relevant speech

tasks, signal selection, and clinical feasibility: vocal f_o and its distribution, vocal IL and its distribution, sound spectrography and acoustic voice markers (including jitter, shimmer and harmonics-to-noise ratio), sound cepstrography with quefrency-domain markers (including CPPS) and a CPPS-time-plot, three-dimensional vocal range estimation with f_o-IL-coordinates coloured based on their harmonics-to-noise ratio as well as a minimum set of measures, Dysphonia Severity Index, and Acoustic Voice Quality Index. Currently, acoustic assessment of voice in our clinic is accomplished completely in the program Praat through these plugins.

Learning objective

Participants will be able to

- understand the importance of adequate sound recording quality;
- comment on the use of Phonanium plugins for the clinical assessment of acoustic voice signals;
- identify clinically relevant voice markers.